MARINE ECOLOGY
PROGRESS SERIES

Volume 94 (1993)

Editor
Otto Kinne

Assistant Editor: John Austin
Editorial Assistants: Scott Hanson, Richard Hooper, John Hunt, Rosemarie Stedjee

Ecology Institute, Nordbünte 23, W-2124 Oldendorf/Luhe, Germany
Tel (+49) (0)4132 7127, Fax (+49) (0)4132 8883

Inter-Research
1993

Editorial Advisors

Marine Ecology Progress Series (MEPS) is edited in cooperation with the Editorial Advisors (EAs) listed below and about 300 Anonymous Referees. EAs are appointed for a 4-year period. They critically evaluate the scientific merits of submitted manuscripts. Senior EAs may also act as Sub-editors by processing manuscripts themselves, i.e. see them through a rigorous referee process and present them to the Editor. EAs furthermore recommend authors and topics for reviews to be published in MEPS. Their addresses and fields of expertise are detailed at the end of the last (3rd) issue of each volume, together with the volume contents.

ENVIRONMENTAL FACTORS

Ahmed, S. I., Prof.
School of Oceanography, WB-10, University of Washington, Seattle, WA 98195, USA
Physiological ecology of phytoplankton; thermophilic microorganisms

Alderdice, D., Dr
Pacific Biological Station, Nanaimo, B.C., Canada V9R 5K6
Responses to environmental factors

Collos, Y., Dr
Laboratoire d'Hydrobiologie, Université de Montpellier CC 093, F-34095 Montpellier Cédex 5, France
Nitrogen metabolism of phytoplankton

Dring, M. J., Dr
Botany Dept, The Queen's Univ. of Belfast, Belfast BT7 1NN, Northern Ireland
Physiological ecology of algae

Fisher, N. S., Dr
Marine Sciences Research Center, State Univ. of New York, Stony Brook, NY 11794-5000, USA
Physiological ecology of phytoplankton

Fowler, S. W., Dr
IAEA, ILMR, Stade Louis II, Entrée C-19, Ave des Castellans, MC-98000 Monaco
Trace element metabolism

Haedrich, R. L., Prof.
Memorial University of Newfoundland, St. John's, Nfld., Canada A1B 3X9
Environmental effects on fishes (incl. deep sea)

Kasyanov, V., Dr
Institute of Marine Biology, Academy of Sciences, Vladivostok 690032, Russia
Environmental effects on invertebrates; reproduction, development

Kiørboe, T., Dr
Danish Institute for Fisheries and Marine Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark
Physiological ecology of zooplankton, including fishes (esp. larvae)

Lawrence, J. M., Prof.
Dept of Biology, Univ. of South Florida, Tampa, FL 33620, USA
Physiological ecology of invertebrates

Luoma, S. N., Dr
US Dept of the Interior, Geological Survey, Water Resources Div., 345 Middlefield Rd, Menlo Park, CA 94025, USA
Geochemical and biological factors affecting biochemical processes in invertebrates; contaminant effects on bioavailability

McLusky, D. S., Dr
Dept of Biological Sciences, Univ. Stirling, Stirling FK9 4LA, Scotland
Physiological ecology of invertebrates

Meyer-Reil, L.-A., Dr
Institut für Meereskunde, Univ. Kiel, Düsternbrooker Weg 20, W-2300 Kiel, Germany
Environmental effects on benthic microorganisms, benthic microbial ecology

Meyers, S. P., Prof.
Dept of Food Science, Louisiana State Univ., Baton Rouge, LA 70803, USA
Physiological ecology of microorganisms

Paasche, E., Prof.
Dept of Biology, Univ. Oslo, Marine Botany, PO Box 1069, Blindern, N-0316 Oslo 3, Norway
Physiological ecology of phytoplankton; primary production; benthic algae

Rheinheimer, G., Prof.
Institut für Meereskunde, Univ. Kiel, Düsternbrooker Weg 20, W-2300 Kiel, Germany
Marine microbiology

Riisgård, H. U., Dr
Odense Universitet, Biologisk Institut, Campusvej 55, DK-5230 Odense M., Denmark
Environmental effects on invertebrates; bioenergetics of suspension feeders

Southward, A. J., Dr
Plymouth Marine Laboratory, Citadel Hill, Plymouth PL1 2PB, England
Environmental effects on invertebrates

Vernberg, J., Prof.
Belle W. Baruch Institute for Marine Biol. and Coastal Res., Univ. of South Carolina, Columbia, SC 29208, USA
Physiological ecology of invertebrates

West, J. A., Prof.
Dept of Plant Biology, Univ. of California, 111 Genetics Plant Biology Bldg, Berkeley, CA 94720, USA
Physiological ecology and reproductive biology of estuarine and marine benthic macroalgae

Westernhagen, H. von, Dr
Biologische Anstalt Helgoland, Notkestr. 31, W-2000 Hamburg 52, Germany
Effects of pollution on marine communities

Winter, J. E., Dr
Instituto de Zoología, Univ. Austral de Chile, Casilla 567, Valdivia, Chile
Physiological ecology of invertebrates

PHYSIOLOGICAL MECHANISMS

Alderdice, D., Dr
Pacific Biological Station, Nanaimo, B.C., Canada V9R 5K6
Resistance to stress including pollution; regulation; adaptation

Browman, H. I., Dr
Dept of Biology, University of Victoria, PO Box 1700, Victoria, B.C., Canada V8W 2Y2
Foraging behavior and development of (sensory) organs, especially in fishes

Batty, R. S., Dr
Dunstaffnage Marine Research Laboratory, PO Box 3, Oban, Argyll PA34 4AD, Scotland
Behavioral physiology of fish; feeding; predation of fish larvae

Brown, B. E., Dr
Dept of Biology, The University, Newcastle-upon-Tyne NE1 7RU, England
Physiology and ecology of corals

Burton, R. S., Prof.
Marine Biology Research Division 0202, Scripps Institution of Oceanography, University of California, 9500 Gilman, La Jolla, CA 92093-0202, USA
Population genetics; evolutionary mechanisms in populations; biochemical and molecular genetic analyses of invertebrates

Caron, D. A., Dr
Biology Dept, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA
Feeding, respiration and nutrient regeneration of protozoans

Chapman, A. R. O., Prof.
Institut für Meereskunde an der Universität Kiel, Düsternbrooker Weg 20, W-2300 Kiel 1, Germany
Physiology and demography of macroalgae

Conover, R. J., Dr
Marine Ecology Laboratory, Bedford Institute of Oceanography, PO Box 1006, Dartmouth, N.S., Canada B2Y 4A2
Physiology and biochemistry of zooplankton

Costlow, J. D., Jr, Prof.
Duke University Marine Laboratory, Pivers Island, Beaufort, NC 28516, USA
Developmental physiology; endocrinology

Enright, J. T., Prof.
Scripps Institution of Oceanography, San Diego, PO Box 1529, La Jolla, CA 92093, USA
Biological rhythms

Forward, R. B., Jr, Dr
Duke University Marine Laboratory Pivers Island, Beaufort, NC 28516–9721, USA
Environmental zoo-physiology; behavior; biological rhythms

Fowler, S. W., Dr
IAEA, ILMR, Stade Louis II, Entrée C-19, Ave des Castellans, MC-98000 Monaco
Trace element metabolism

Gerking, S. D., Prof.
Dept of Zoology, Arizona State Univ.,Tempe, AZ 85281, USA
Fish physiology

Holland, N. D., Prof.
Scripps Institution of Oceanography, San Diego, PO Box 1529, La Jolla, CA 92093, USA
Comparative, cellular and developmental physiology

Humphrey, G. F., Dr
CSIRO Marine Biochemistry, Building A12, Sydney Univ., N.S.W. 2006, Australia
Photosynthesis; plankton biochemistry

Leftley, J. W., Dr
Dunstaffnage Marine Laboratory, PO Box 3, Oban, Argyll PA34 4AD, UK
Physiology and biochemistry of microalgae (laboratory and field); nitrogen metabolism

Levandowsky, M., Dr
Haskins Laboratories at Pace Univ., 41 Park Row, New York, NY 10038, USA
Chemosensory behavior; mathematical models

McLusky, D. S., Dr
Dept of Biological Sciences, Univ. Stirling, Stirling FK9 4LA, Scotland
Osmoregulation in estuarine invertebrates

Naylor, E., Prof.
School of Ocean Sciences, Univ. of Wales, Menai Bridge, Gwynedd LL59 5EY, Wales, UK
Behavioural physiology; invertebrate biology

Pawlik, J., Dr
The University of North Carolina at Wilmington, Wilmington, NC 28403-3297, USA
Chemical defense of invertebrates; antifouling, chemical cues

Puiseux-Dao, S., Prof.
Laboratoire de Cytophysiologia végétale et de Toxicologie cellulaire, Université de Paris VII, 2 Place Jussieu, F-75251 Paris Cédex 05, France
Ecophysiology and toxicology of algae; cellular biology; behavior of algae

Rivkin, R. B., Prof.
Ocean Sciences Centre, University of Newfoundland, St. John's, Nfld, Canada A1C 5S7
Phytoplankton physiology and ecology

Shick, J. M., Prof.
Dept. of Zoology, Univ. of Maine, Murray Hall, Orono, ME 04469-5751, USA
Physiological energetics of invertebrates, incl. metabolic calorimetry; symbioses; hyperoxia and oxidative stress; effects of UV light; sea anemone biology

Videler, J. J., Dr
Dept of Marine Biology, Univ. of Groningen, PO Box 14, 9750 AA Haren, The Netherlands
Swimming dynamics of plankton; activity pattern and reproductive strategies of fishes; energy budgets of herbivores

West, J. A., Prof.
Dept of Plant Biology, Univ. of California, 111 Genetics Plant Biology Bldg, Berkeley, CA 94720, USA
Chemistry of red algae; molecular genetics of red and green algae

Wieser, W., Prof.
Institut für Zoologie der Leopold-Franzens-Universität Innsbruck, Technikerstraße 25, A-6020 Innsbruck, Austria
Physiological ecology of invertebrates

Zhirmunsky, A. V., Prof.
Institute of Marine Biology, Academy of Sciences, Vladivostok 690032, Russia
Mechanisms of cellular resistance and control

CULTIVATION

Lawrence, J. M., Prof.
Dept of Biology, Univ. of South Florida, Tampa, FL 33620, USA
Nutrition of invertebrates

Levandowsky, M., Dr
Haskins Laboratories at Pace Univ., 41 Park Row, New York, NY 10038, USA
Microcosm cultures

Meyers, S. P., Prof.
Dept of Food Science, Louisiana State Univ., Baton Rouge, LA 70803, USA
Cultivation of microorganisms and crustaceans; aquaculture; microenvironments

Pandian, T. J., Prof.
School of Biological Sciences, Madurai Kamaraj Univ., Madurai 625 021, Tamilnadu, India
Cultivation of decapods and fishes; bioenergetics

Rheinheimer, G., Prof.
Institut für Meereskunde, Univ. Kiel, Düsternbrooker Weg 20, W-2300 Kiel, Germany
Cultivation of microorganisms

Winter, J. E., Dr
Instituto de Zoología, Univ. Austral de Chile, Casilla 567, Valdivia, Chile
Cultivation of invertebrates

DYNAMICS

Ahmed, S. I., Prof.
School of Oceanography, WB-10, University of Washington, Seattle, WA 98195, USA
Phytoplankton ecology; greenhouse gases and global ocean flux; sedimentary microbiology; mangrove ecosystems

Alongi, D. M., Dr
Coastal Processes and Resources Program, Australian Institute of Marine Science, PMB No. 3, Townsville M.C., Q. 4810, Australia
Trophic dynamics and nutrient energetics of soft-bottom benthic food webs (particularly tropical microbes and meiofauna)

Azam, F., Prof.
Scripps Institution of Oceanography, Univ. of California, La Jolla, CA 92093, USA
Viral and bacterial ecology; microbial biogeochemistry

Bak, R. P. M., Dr
Nederlands Instituut voor Onderzoek der Zee, Postbox 59, 1790 AB Den Burg – Texel, The Netherlands
Coral-reef ecology

Banse, K., Prof.
School of Oceanography, WB-10, Univ. of Washington, Seattle, WA 98195, USA
Biological oceanography; plankton research

Berman, T., Prof.
Kinneret Limnological Laboratory, PO Box 345, Tiberias 14102, Israel
Phytoplankton ecology

Bianchi, A., Dr
C.N.R.S. ER 223, Microbiologie Marine, Campus de Luminy – case 907, 70, route Léon Lachamp, F-13288 Marseille Cédex 9, France
Marine microbiology; ecological dynamics

Birkeland, C., Prof.
Univ. of Guam, Marine Laboratory, UOG Station, Mangilao, Guam 96913
Coral-reef ecology; benthic ecology

Browman, H. I., Dr
Dept of Biology, University of Victoria, PO Box 1700, Victoria, B.C., Canada V8W 2Y2
Early life history, growth and development in fishes: fish zooplankton interactions

Brattegard, T., Dr
Universitetet i Bergen, Institutt for fiskeri-og marin-biologi, Thormohlens gt. 55, N-5008 Bergen, Norway
Distribution and ecology of malacostracan crustaceans (esp. suprabenthic/hyperbenthic species)

Bunt, J. S., Dr
4/6 McDonald Street, Potts Point, NSW 2011, Australia
Mangrove systems; reef studies

Caron, D. A., Dr
Biology Dept, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA
Microbial ecology; trophic relations between planktonic protozoans and other heterotrophic and photosynthetic organisms; pelagic detrital aggregates

Chapman, A. R. O., Prof.
Institut für Meereskunde an der Universität Kiel, Düsternbrooker Weg 20, W-2300 Kiel 1, Germany
Community ecology of rocky shores

Collos, Y., Dr
Laboratoire d'Hydrobiologie, Université de Montpellier CC 093, F-34095 Montpellier Cédex 5, France
Nitrogen cycling and primary production

Conover, R. J., Dr
Marine Ecology Laboratory, Bedford Institute of Oceanography, PO Box 1006, Dartmouth, N.S., Canada B2Y 4A2
Zooplankton biology

Cushing, D. H., Dr
Ministry of Agriculture, Fisheries and Food, Fisheries Laboratory, Lowestoft, Suffolk NR33 OHT, England
Productivity of the sea; fish-population dynamics; biological oceanography

Elliott, M., Dr
Dept of Applied Biology, Institute of Estuarine and Coastal Studies, The University, Hull HU6 7RX, UK
Structure and function of fish and benthic communities

Feller, R. J., Prof.
Biology and Marine Science, Belle W. Baruch Institute for Marine Biology and Coastal Research, Columbia, SC 29208, USA
Trophic dynamics and energetics of crustaceans; feeding and digestion of fishes; benthic ecology of meiofauna; ecological applications of immunology and serology

Fenchel, T., Prof.
Marine Biological Laboratory (University of Copenhagen), DK-3000 Helsingør, Denmark
Population biology; microbial ecology

Field, J. G., Prof.
University of Cape Town, Zool. Dept, Rondebosch 7700, Republic of South Africa
Dynamics of nearshore ecosystems

Foster, M. S., Prof.
Moss Landing Marine Laboratories, California State Univ., PO Box 450, Moss Landing, CA 95039-040, USA
Population and community ecology of macroalgae

Fowler, S. W., Dr
IAEA, ILMR, Stade Louis II, Entrée C-19, Ave des Castellans, MC-98000 Monaco
Particle flux; biogeochemistry

Fuhrman, J., Prof.
Marine Biology Res. Section, Dept of Biological Sciences, Univ. of Southern California, Los Angeles, CA 90089-0371, USA
Planktonic microbial ecology. Productivity and growth of microorganisms, especially bacteria

Furness, R. W., Dr
Department of Zoology, The University of Glasgow, Glasgow G12 8QQ, Scotland
Ecology of sea birds

Furuya, K., Dr
Faculty of Bioresources, Mie University, 1515 Kamihama, Tsu 514, Japan
Phytoplankton ecology; community structure, dynamics

Gage, J. D., Dr
Dunstaffnage Marine Research Laboratory, PO Box 3, Oban, Argyll PA34 4AD, Scotland
Benthos of deep sea and temperate coasts

Gray, J., Prof.
Institutt for Marinbiologi og Limnologi, Univ. Oslo, Postboks 1064, Blindern, Oslo 3, Norway
Soft-sediment ecology

Haedrich, R. L., Dr
Memorial University of Newfoundland, St. John's, Nfld., Canada A1B 3X9
Zoogeography; natural history of fish

Hansen, B., Dr
Roskilde University, Institute I, Life Sciences & Chemistry, PO Box 250, DK-4000 Roskilde, Denmark
Laboratory and in situ studies on zooplankton; secondary production (grazing, growth, energetics, feeding behaviour)

Harding, G. C., Dr
Marine Ecology Laboratory, Bedford Institute of Oceanography, PO Box 1006, Dartmouth, N.S., Canada B2Y 4A2
Crustacean ecology (incl. deep sea)

Heck, K. L., Jr, Dr
Marine Environmental Sciences Consortium, Dauphin Island Sea Lab., PO Box 369-370, Dauphin Island, AL 36528, USA
Benthic ecology, emphasis on seagrass ecosystems

Holm-Hansen, O., Dr
Scripps Inst. of Oceanography, Univ. of California, La Jolla, CA 92093-0202, USA
Polar ecology; chemical oceanography; photosynthesis

Hoppe, H.-G., Prof.
Institut für Meereskunde, Univ. Kiel, Düsternbrooker Weg 20, W-2300 Kiel 1, Germany
Microbiology, including methods; microbial plantology

Hudon, C., Dr
Halifax Research Laboratory, C.P. 550, Halifax, N.S., Canada B3J 2S7
Crustacean ecology and biology

Hughes, R. N., Dr
School of Animal Biology, Univ. College North Wales, Bangor, Gwynedd LL57 2UW, Wales, UK
Ecological energetics (particularly feeding)

Karlson, R. H., Prof.
School of Life and Health Sciences Ecology Program, Univ. of Delaware, Newark, DE 19716, USA
Population and community ecology of benthic invertebrates

Kiørboe, T., Dr
Danish Institute for Fisheries and Marine Res., Charlottenlund Castle, DK-2910 Charlottenlund, Denmark
Biological oceanography; physical and biological processes in the pelagial with emphasis on copepods and fish larvae

Klumpp, D., Dr
Australian Institute of Marine Science, PMB No. 3, Townsville M. C., Q. 4810, Australia
Trophodynamics; animal nutrition, energy and nutrient budgets; nutrient cycling; primary productivity; fish biology; seagrass, coral reef, kelp bed ecosystems

Landry, M. R., Dr
Dept of Oceanography, Univ. of Hawaii, Manoa, 1000 Pope Rd, Honolulu, HI 96822, USA
Food web interactions; zooplankton ecology

Lawrence, J. M., Prof.
Dept of Biology, Univ. of South Florida, Tampa, FL 33620, USA
Reproduction of invertebrates; nutrition

Levandowsky, M., Dr
Haskins Laboratories at Pace Univ., 41 Park Row, New York, NY 10038, USA
Ecological modelling; phytoplankton ecology

Levings, C., Dr
West Vancouver Laboratory, 4160 Marine Drive, West Vancouver, B.C., Canada V7V 1N6
Estuarine ecology of macrobenthos and fish

Lewis, J. B., Dr
Dept of Biology, McGill Univ., Stewart Biology Bldg, 1205 Dr. Penfield, Montreal, Quebec, Canada H3A 1B1
Coral-reef ecology; tropical marine biology

Lewis, M. R., Dr
Dept of Oceanography, Dalhousie University, Halifax, N.S., Canada B3H 4J1
Biological oceanography; phytoplankton physiology; modelling of physical and biological processes

Luoma, S. N., Dr
US Dept of the Interior, Geological Survey, Water Resources Div., 345 Middlefield Rd, Menlo Park, CA 94025, USA
Feeding ecology of deposit feeders; geochemistry of trace elements in sediments

Marcus, N. H., Dr
Dept of Oceanography, Florida State Univ., B-169, Tallahassee, FL 32306-3048, USA
Zooplankton ecology; biology and genetics of invertebrate populations; rhythms (e.g. spawning, feeding)

Mauchline, J., Dr
Scottish Marine Biological Ass., Dunstaffnage Marine Res. Lab., PO Box 3, Oban, Argyll PA34 4AD, Scotland
Deep-sea ecology; radioactive pollution

Moriarty, D., Dr
CSIRO Marine Laboratories, Division of Fisheries, PO Box 120, Cleveland, Qld. 4163, Australia
Microbial ecology and biochemistry; role of microorganisms in bio-geochemical cycles and food webs; molecular techniques in bacterial ecology

Nelson, D. M., Prof.
College of Oceanography, Oregon State Univ., Oceanography Admin. Bldg. 104, Corvallis, OR 97331, USA
Phytoplankton ecology; nutrient cycling

Newell, S. Y., Dr
The University of Georgia, Marine Institute, Sapelo Island, GA 31327, USA
Ecology of fungi and bacteria; decomposition

Nybakken, J., Prof.
Moss Landing Marine Laboratories, California State Univ., PO Box 450, Moss Landing, CA 95039-0450, USA
Ecology of molluscs; community structure of soft-sediment invertebrates

Pawlik, J., Dr
The University of North Carolina at Wilmington, Wilmington, NC 28403-3297, USA
Ecology and biology of invertebrate larvae; settlement; recruitment; life histories; dispersal; natural products

Pearse, J. S., Prof.
Center for Coastal Marine Studies, Univ. of California, Santa Cruz, CA 95064, USA
Kelp forest ecology; reproductive ecology

Peterson, C. H., Prof.
Institute of Marine Science, Univ. of N. Carolina at Chapel Hill, 3407 Arendell Street, Morehead City, NC 28557, USA
Marine benthic ecology; population biology

Platt, T., Dr
Marine Ecology Laboratory, Bedford Institute of Oceanography, PO Box 1006, Dartmouth, N.S., Canada B2Y 4A2
Phytoplankton ecology; primary production

Purcell, J. E., Dr
The University of Maryland Systems, Center for Environmental and Estuarine Studies, PO Box 775, Cambridge, MD 21613, USA
Zooplankton ecology and behavior; trophic dynamics; prey selection. Competition for space among benthic invertebrates

Rassoulzadegan, F., Dr
Station Zoologique, BP 28, F-06230 Villefranche-sur-Mer, France
Microbial ecology (food webs, microbial loop); pico- and nanoplankton; planktonic flagellates and ciliates; micro- and mesozooplankton; carbon flux

Reise, K., Prof.
Biologische Anstalt Helgoland, W-2282 List/Sylt, Germany
Benthos ecology

Rivkin, R. B., Prof.
Ocean Sciences Centre, University of Newfoundland, St. John's, Nfld., Canada A1C 5S7
Microbial ecology; polar planktonic process; lower food web dynamics

Savidge, G., Dr
The Queen's Univ. of Belfast, Marine Biology Station, The Strand, Portaferry, Co. Down, Northern Ireland
Phytoplankton ecology; primary production; photosynthesis

Scheltema, R. S., Dr
Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA
Invertebrate larval ecology

Schneider, D. C., Dr
Newfoundland Institute for Cold Ocean Science, Memorial University of Newfoundland, St. John's, Nfld., Canada A1B 3X7
Dynamics of large organisms; ecology of sea birds

Sherr, B. & E., Drs
College of Oceanography, Oregon State Univ., Oceanogr. Admin Bldg 104, Corvallis, Oregon 97331, USA
Microbial food webs; trophic roles of phagotrophic protozoans

Skjoldal, H. R., Dr
Institute of Marine Research, Postboks 1870, N-5024 Bergen-Nordnes, Norway
Food webs and trophic interactions

Southward, A. J., Dr
Plymouth Marine Laboratory, Citadel Hill, Plymouth PL1 2PB, England
Rocky-coast ecosystems; deep-sea ecosystems

Stoecker, D. K., Dr
Horn Point Environmental Laboratories, PO Box 775, Cambridge, MD 21613, USA
Microzooplankton, particularly ciliates; secondary production

Tenore, K. R., Prof.
Chesapeake Biological Laboratory, PO Box 38, Solomons, MD 20688-0038, USA
Benthic ecology and bioenergetics; production; food chains of detritus-based systems

Thayer, G. W., Dr
Ecosystem Structure Branch, Southeast Fisheries Center, Beaufort, NC 28516-9722, USA
Wetlands ecology, incl. submerged seagrasses and emergent marshes; production and utilization of detritus

Underwood, A. J., Dr
School of Biol. Sci., Univ. Sydney, Zoology Building, Sydney, N.S.W. 2006, Australia
Experimental intertidal and subtidal ecology; behavior; life cycles of sessile invertebrates

Vinogradov, M. E., Prof.
P. P. Shirshov Institute of Oceanology, Academy of Sciences of USSR, 1, Letnaya (Ljublino), Moscow 109387, Russia
Oceanic plankton ecosystems; deep-sea amphipods; biological oceanography

Wangersky, P. J., Prof.
Dept of Oceanography, Dalhousie Univ., Halifax, N.S., Canada B3H 4J1
Organic matter in sea water; theoretical population dynamics; geochemistry; chemical oceanography

Warwick, R. M., Dr
Plymouth Marine Laboratory, Prospect Place, West Hoe, Plymouth PL1 3DH, England
Structure and functioning of benthic communities; meiofaunal ecology; energy flow

West, J. A., Prof.
Dept of Plant Biology, Univ. of California, 111 Genetics Plant Biology Bldg, Berkeley, CA 94720, USA
Reproductive dynamics of red algae; fine structure and parasites of algae

Williams, R., Dr
Plymouth Marine Laboratory, Prospect Place, West Hoe, Plymouth PL1 3DH, England
Plankton ecology; community structure, population dynamics

Wu, B. L., Prof.
First Institute of Oceanography, State Oceanic Administration, PO Box 98, Qingdao, People's Republic of China
Ecology and morphology of coelenterates, echinoderms and polychaetes. Development and reproduction of polychaetes and phoronids

OCEAN MANAGEMENT

Ahmed, S. I., Prof.
School of Oceanography, WB-10, University of Washington, Seattle, WA 98195, USA
Biofouling; application of biotechnology to marine systems

Alderdice, D., Dr
Pacific Biological Station, Nanaimo, B.C., Canada V9R 5KR
Pollution of marine environments

Bernhard, M., Dr
ENEA, PO Box 316, I-19100 La Spezia, Italy
Radioactive and conventional pollution

Brown, B. E., Dr
Dept of Biology, The University, Newcastle-upon-Tyne NE1 7RU, England
Effects of man-made and natural disturbances on coral reefs

Bryan, G. W., Dr
Plymouth Marine Laboratory, Citadel Hill, Plymouth PL1 2PB, England
Heavy metal pollution; estuarine chemistry

Eisler, R., Dr
U.S. Dept of the Interior, Fish and Wildlife Service, Laurel, MD 20708, USA
Toxicology and pollution

Elliott, M., Dr
Dept of Applied Biology, Institute of Estuarine and Coastal Studies, The University, Hull HU6 7RX, UK
Marine pollution assessment and control

Fisher, N. S., Dr
Marine Sciences Research Center, State Univ. of New York, Stony Brook, NY 11794-5000, USA
Pollutant effects on plankton; radioecology

Fowler, S. W., Dr
IAEA, ILMR, Stade Louis II, Entrée C-19, Ave des Castellans, MC-98000 Monaco
Pollution effects on zooplankton; radioecology

Gray, J., Prof.
Institutt for Marinbiologi og Limnologi, Univ. Oslo, Postboks 1064, Blindern, Oslo 3, Norway
Pollution effects on benthos animals

Luoma, S. N., Dr
US Dept of the Interior, Geological Survey, Water Resources Div., 345 Middlefield Rd, Menlo Park, CA 94025, USA
Bioaccumulation of trace contaminants (principally trace elements and radionuclide waste products)

Mauchline, J., Dr
Scottish Marine Biological Ass., Dunstaffnage Marine Res. Lab., PO Box 3, Oban, Argyll PA34 4AD, Scotland
Radioactive pollution

McLusky, D. S., Dr
Dept of Biological Sciences, Univ. Stirling, Stirling FK9 4LA, Scotland
Biological effects of pollutants (petro-, chemical, organic enrichment)

Peterson, C. H., Prof.
Institute of Marine Science, Univ. of N. Carolina at Chapel Hill, 3407 Arendell Street, Morehead City, NC 28557, USA
Fisheries management and ecology

Polikarpov, G. G., Prof.
Institute of Biology of South Seas, Academy of Sciences Uk. SSR, 2, Nahimov St., Sevastopol 335000, Ukraine
Chemical ecology, radioecology, radiotracers, pollution; protection of sea life

Sherman, K., Dr
US Dept of Commerce, NOAA, Northeast Fisheries Center, 28 Tarzwell Dr., Narragansett, RI 02882, USA
Fisheries ecology; fishery resources; zooplankton

Westernhagen, H. von, Dr
Biologische Anstalt Helgoland, Notkestr. 31, W-2000 Hamburg 52, Germany
Fish egg and larval survival

Wu, B. L., Prof.
First Institute of Oceanography, State Oceanic Administration, PO Box 98, Qingdao, People's Republic of China
Effects of pollutants on benthic organisms

CONTENTS

Volume 94 · Number 1 · 1993

RESEARCH ARTICLES

González, J. M., Suttle, C. A.
Grazing by marine nanoflagellates on viruses and virus-sized particles: ingestion and digestion 1–10

Pierce, R. W., Turner, J. T.
Global biogeography of marine tintinnids 11–26

Cartes, J. E., Sardà, F.
Zonation of deep-sea decapod fauna in the Catalan Sea (Western Mediterranean) 27–34

Hentschel, U., Cary, S. C., Felbeck, H.
Nitrate respiration in chemoautotrophic symbionts of the bivalve *Lucinoma aequizonata* 35–41

Nandakumar, K., Tanaka, M., Kikuchi, T.
Interspecific competition among fouling organisms in Tomioka Bay, Japan 43–50

Saila, S. B., Kocic, V. Lj., McManus, J. W.
Modelling the effects of destructive fishing practices on tropical coral reefs 51–60

West, J. M., Harvell, C. D., Walls, A.-M.
Morphological plasticity in a gorgonian coral (*Briareum asbestinum*) over a depth cline 61–69

Neundorfer, J. V., Kemp, W. M.
Nitrogen versus phosphorus enrichment of brackish waters: responses of the submersed plant *Potamogeton perfoliatus* and its associated algal community 71–82

Burdick, D. M., Short, F. T., Wolf, J.
An index to assess and monitor the progression of wasting disease in eelgrass *Zostera marina* 83–90

Olesen, B., Sand-Jensen, K.
Seasonal acclimatization of eelgrass *Zostera marina* growth to light 91–99

NOTE

Wilson, R. P., Puetz, K., Bost, C. A., Culik, B. M., Bannasch, R., Reins, T., Adelung, D.
Diel dive depth in penguins in relation to diel vertical migration of prey: whose dinner by candlelight? 101–104

Volume 94 · Number 2 · 1993

RESEARCH ARTICLES

Robertson, D. R., Schober, U. M., Brawn, J. D.
Comparative variation in spawning output and juvenile recruitment of some Caribbean reef fishes 105–113

Kneib, R. T.
Growth and mortality in successive cohorts of fish larvae within an estuarine nursery 115–127

Laprise, R., Dodson, J. J.
Nature of environmental variability experienced by benthic and pelagic animals in the St. Lawrence Estuary, Canada 129–139

Litaker, W., Duke, C. S., Kenney, B. E., Ramus, J.
Short-term environmental variability and phytoplankton abundance in a shallow tidal estuary. II. Spring and fall 141–154

Kruse, B.
Measurement of plankton O_2 respiration in gas-tight plastic bags 155–163

Herman, A. W., Cochrane, N. A., Sameoto, D. D.
Detection and abundance estimation of euphausiids using an optical plankton counter 165–173

Hole, L. M., Moore, M. N., Bellamy, D.
Age-related cellular reactions to copper in the marine mussel *Mytilus edulis* 175–179

Santos, R.
A multivariate study of biotic and abiotic relationships in a subtidal algal stand 181–190

Opsahl, S., Benner, R.
Decomposition of senescent blades of the seagrass *Halodule wrightii* in a subtropical lagoon 191–205

Volume 94 · Number 3 · 1993

RESEARCH ARTICLES

MacKenzie, B. R., Leggett, W. C.
Wind-based models for estimating the dissipation rates of turbulent energy in aquatic environments: empirical comparisons 207–216

Nelson, N. B., Prézelin, B. B., Bidigare, R. R.
Phytoplankton light absorption and the package effect in California coastal waters 217–227

Szyper, J. P., Ebeling, J. M.
Photosynthesis and community respiration at three depths during a period of stable phytoplankton stock in a eutrophic brackish water culture pond 229–238

Lignell, R., Heiskanen, A.-S., Kuosa, H., Gundersen, K., Kuuppo-Leinikki, P., Pajuniemi, R., Uitto, A.
Fate of a phytoplankton spring bloom: sedimentation and carbon flow in the planktonic food web in the northern Baltic 239–252

Brettar, I., Höfle, M. G.
Nitrous oxide producing heterotrophic bacteria from the water column of the central Baltic: abundance and molecular identification 253–265

Joye, S. B., Paerl, H. W.
Contemporaneous nitrogen fixation and denitrification in intertidal microbial mats: rapid response to runoff events 267–274

Cheng, I.-J., Levinton, J. S., McCartney, M., Martinez, D., Weissburg, M. J.
A bioassay approach to seasonal variation in the nutritional value of sediment 275–285

Wassenberg, T. J., Hill, B. J.
Diet and feeding behaviour of juvenile and adult banana prawns *Penaeus merguiensis* in the Gulf of Carpentaria, Australia 287–295

Herring, P. J., Latz, M. I., Bannister, N. J., Widder, E. A.
Bioluminescence of the poecilostomatoid copepod *Oncaea conifera* 297–309

MARINE ECOLOGY PROGRESS SERIES

HISTORY: Marine Ecology Progress Series (MEPS) was established in response to requests from numerous marine ecologists from all over the world. When founded, MEPS was based on 'Marine Ecology' – the first comprehensive, integrated treatise on life in oceans and coastal waters – conceived, organized and edited by Professor Otto Kinne, and published by John Wiley & Sons.

AIM: MEPS serves as a world-wide forum for all aspects of marine ecology, fundamental and applied. The journal covers: microbiology, botany, zoology, ecosystem research, biological oceanography, ecological aspects of fisheries and aquaculture, pollution, environmental protection, conservation, resource management.
Ecological research has become of paramount importance for man's future. The information presented here should, therefore, encourage critical application of ecological knowledge for the benefit of mankind and, in fact, of life on earth. Marine Ecology Progress Series has received recognition as the leader in its field. The journal strives for

- complete coverage of the field of marine ecology
- the highest possible quality of scientific contributions
- quick publication
- a high technical standard of presentation.

SCOPE: MEPS is international and interdisciplinary. It presents rigorously refereed and carefully selected research articles, reviews and notes concerned with:

Environmental Factors: Tolerances and responses of marine organisms (microorganisms, autotrophic plants, and animals) to variations in abiotic and biotic components of their environment; radioecology.

Physiological Mechanisms: Synthesis and transversion of organic material (mechanisms of auto- and heterotrophy); thermo-, ion-, osmo- and volume-regulation; stress resistance; non-genetic and genetic adaptation; population genetics; orientation in space and time; migrations; behavior; molecular basis of ecological processes.

Cultivation: Maintenance and rearing of, as well as experimentation with, marine organisms under environmental and nutritional conditions which are, to a considerable degree, controlled; analysis of the physiological and ecological potential of individuals, populations and species; determination of nutritional requirements; ecological aspects of aquaculture; water-quality management; culture technology.

Dynamics: Production, transformation, and decomposition of organic matter; flow patterns of energy and matter as these pass through organisms, populations and ecosystems; biodiversity; variability of ecosystem components; trophic interrelations; population dynamics; plankton ecology; benthos ecology; estuarine and coastal ecology; wadden-sea ecology; coral reef ecology; deep-sea ecology; open-ocean ecology; polar ecology; theoretical ecology; ecological modelling and computer simulation.

Ocean Management: Human-caused impacts: their role as modifiers and deformers of living systems, their biological consequences and their management and control; inventory of living resources in coastal areas, estuaries and open oceans; ecological aspects of fisheries; pollution of marine areas and organisms; protection of life in the seas; management of populations, species and ecosystems; management of coastal zones and sea areas; biotechnology.

Publisher: Inter-Research, PO Box 1120, W-2124 Amelinghausen, Germany
Tel (+49) (0)4132 7127, Fax (+49) (0)4132 8883

Copyright © Inter-Research, Amelinghausen, 1993. All rights reserved. Mar. Ecol. Prog. Ser. 1993. Typesetting by Inter-Research. Printed in Germany by Westholsteinische Verlagsdruckerei Boyens & Co., W-2240 Heide.

Scientific publications appearing in this journal have been rigorously refereed, carefully quality-improved, and professionally selected by our editorial staff. These publications, and all parts thereof, are protected by copyright. This covers the exclusive rights of the publisher *to reproduce* (by any means, including photographic or electronic), *to distribute* (including via photocopies, reprints, or electronic means), and *to store* on microfilm, in electronic data bases, on video disks, etc., this material. The acceptance regulations of a manuscript for publication automatically include the consent of the author(s) to transfer the copyright to the publisher. Permissions for exceptions to this rule must be obtained in writing from the publisher.
In the USA, photocopies may be made for personal or in-house use beyond the limitations stipulated under Section 107 of 108 of U.S. Copyright Law, provided a fee (US $3.00 per article) is paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA.

Publisher, editors and authors do not accept legal responsibility for errors, omissions or claims, nor do they provide any warranty, express or implied, with respect to information published in MEPS.